Reduced Reservoir Description Uncertainty Through Combination of Multiple Uncertain Datasets: Chasing Smaller Infill Targets on a Mature Waterflood With a New Lease of Life

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ABSTRACT

Schiehallion Field (UKCS 1.6bbn bbl subsea waterflood development online 1997-2013) is to get new production facilities in 2017, underpinned by base, satellite and infill production. On such a complex mature field the integration and infill-screening tool of choice is often a history-matched full-field model (FFM), populated by 3D seismic, ideally coupled to a petro-elastic model that can qc the 4D match. However 4D shows additional reservoir depositional architecture that 3D doesn't fully resolve. This carries uncertainty because noise means not every 4D anomaly is genuine. Pre- and post-production MDTs may be ambiguous and dynamic information from aging infrastructure non-deterministic. Accepting that datasets are often conflicting and rarely definitive, the requirement for infill screening is to test multiple scenarios quickly, which is a challenge when equipped with a FFM that took years to build and history-match. For a field-scale match the FFM can be optimised by AI, but at the scale of infill wells manual intervention is required. Finally, insights from multiple, plausible, approximations to reality and the thinking process behind these are normally more valuable than spending time reconciling data conflicts in the search for perfection. Our geobody-based model is a blessing and a curse. Geobodies are small, flexible and can be dissected better than layers, but model lag means that yesterday's geobodies do not always match today's seismic. Inputting different seismic-based net distributions is often the first step in updating a history match. Accepting that manual intervention has to override our "world class" seismic where it does not match the wells, the partnership has complimentary proprietary seismic inversion tools giving alternative net distributions to be tested. Integrating 4D with a thorough understanding of production history, allocation uncertainty and robust geological models leads to numerous plausible scenarios, many of which can be tested with minimal changes to the model. Where model changes are necessary a number of tools allow the model to be sliced and diced to examine and change net distribution and connectivity. The process that has emerged is still largely manual, but uses a number of scripts to reduce data manipulation and let the team focus on understanding rather than number-crunching. The end results are more detailed insights into infill well screening, an essential as the development proceeds down the creaming curve.